CLAIMS

What we claim is:

1. A heavy duty flame propagation engine having at least one combustion chamber having at least one intake port through which a mixture of air and fuel is introduced into said combustion chamber, said engine comprising:

an intake manifold in controlled fluid communication with a source of combustion air and said combustion chamber;

a means for controllably introducing fuel through an intake port disposed between said intake manifold and said combustion chamber;

an exhaust system in controlled fluid communication with said combustion chamber; and

a three-way catalyst disposed in said exhaust system.

2. The heavy duty flame propagation engine, as set forth in Claim 1, wherein said means for controllably introducing fuel into said intake manifold comprises a fuel injector disposed in the intake manifold at a position adjacent said combustion chamber intake port.

3. The heavy duty flame propagation engine, as set forth in Claim 1, wherein said engine includes a means for controlling the air-fuel mixture and provide a substantially stoichiometric mixture of air and fuel into said combustion chamber of the engine.

4. The heavy duty flame propagation engine, as set forth in Claim 3, wherein said intake manifold includes a means for controlling the flow of air passing through said manifold, and said means for controlling the air/fuel mixture and provide a substantially stoichiometric mixture of air and fuel into said combustion chamber of the engine includes a sensor disposed in said exhaust system and adapted to measure oxygen partial pressure and generate a signal suitable for use as a feedback air/fuel ratio control.

5. The heavy duty flame propagation engine, as set forth in Claim 3, wherein said engine comprises a includes a plurality of combustion chambers and a means for controllably deactivating selected ones of said combustion chambers.

6. The heavy duty flame propagation engine, as set forth in Claim 5, wherein each combustion chamber has at least one intake valve adapted to control the flow of the mixture of air and fuel provided to said combustion chamber, at least one exhaust valve adapted to control the flow of exhaust gases from said combustion chamber into said exhaust system, and a means for varying the operation of said intake valve and said exhaust valve.

7. The heavy duty flame propagation engine, as set forth in Claim 3, wherein said engine includes a means for controlling the recirculation of exhaust gas from said exhaust system to said intake manifold.

8. The heavy duty flame propagation engine, as set forth in Claim 3, wherein said engine includes a high energy ignition system.

9. A heavy duty flame propagation engine, comprising:

at least one combustion chamber;

a fuel injector disposed in said combustion chamber and adapted to inject fuel directly into said combustion;

a means for controlling the timing of fuel injection into said combustion chamber whereby fuel injected into said combustion chamber during a compression stroke of the engine forms a stratified air/fuel charge, and when injected during an intake stroke of the engine forms a homogeneous stoichiometric air/fuel charge.

10. The heavy duty flame propagation engine, as set forth in Claim 9, wherein said engine comprises a includes a plurality of combustion chambers and a means for controllably deactivating selected ones of said combustion chambers.

11. The heavy duty flame propagation engine, as set forth in Claim 9, wherein said engine includes an intake manifold in fluid communication with said combustion chamber, an exhaust manifold in fluid communication with said combustion chamber, and an exhaust gas recirculation system in controllable fluid communication with said exhaust manifold and said intake manifold.

12. A heavy duty flame propagation engine, as set forth in Claim 9, wherein said engine includes a pilot fuel injector in direct communication with said combustion chamber and a means for controllable injecting fuel into the combustion chamber in advance of a primary injection of fuel.

13. A heavy duty flame propagation engine, as set forth in Claim 9, wherein said fuel injector is adapted to inject fuel into said combustion chamber at selected multiple times during each engine cycle.

14. The heavy duty flame propagation engine, as set forth in Claim 9, wherein said engine includes an oxidation catalyst and a lean NO_X trap in fluid communication with said exhaust manifold of the engine.